

## HEADSTART

Make a table for the parent function  $y=1/x$ 

x	y=1/x
-10	
-5	
-1	
-.5	
-.01	
.01	
.5	
1	
5	
10	

# Reciprocal Function

$x$	$y = \frac{1}{x}$
-10	-0.1
-1	-1
-0.1	-10
0.1	10
1	1
10	0.1

$$y = \frac{1}{x}$$

$$y = \frac{1}{x} \rightarrow$$

$$y = \frac{0.5}{x-3} + 5$$

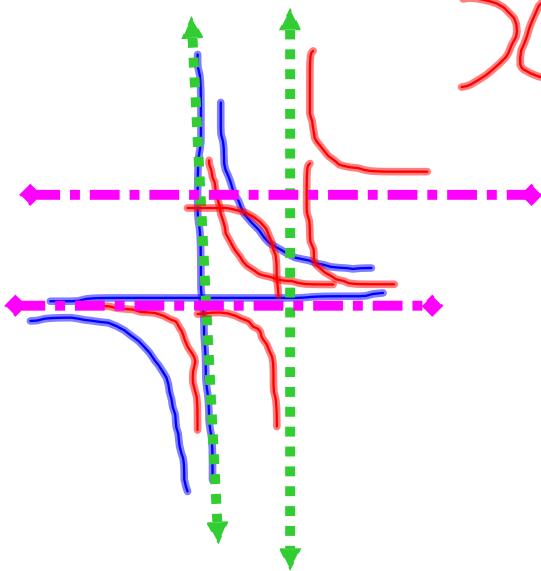
$$f(x) = \frac{1}{x}$$

$$= 0.5$$

$$f(0.5x) = \frac{1}{0.5x}$$

Ex 1.  $a, k, d, c???$

$$y = \frac{0.5}{x-3} + 5$$



$d$

$c$

$$y = a f [k(x-d)] + c$$

$$y = 0.5 \times \frac{1}{x-3} + 5$$

$x$		$y$		$x^{0.5}$
<del>-10</del>	<del>+3</del> -7	4.95	-0.1	-0.05
<del>-1</del>	+2	4.5	-1	-0.5
<del>-0.1</del>	2.9	0	-10	-5
<del>0.1</del>	3.1	10	10	5
<del>1</del>	4	5.5	+1	0.5
<del>10</del>	13	5.05	0.1	0.05

## 1.8 Using Transformations to Graph Functions of the form $y = a f[k(x-d)] + c$

Yesterday, we learned....

$$y = f(kx)$$

What does the  $k$  do to the function  $f(x)$ ?

What variable does it affect?

Do you multiply or divide by  $k$ ???

$$y = -2 f[ -3(x-5) ] + 1$$

$\uparrow$   $\uparrow$   $\uparrow$   $\uparrow$   
 $a$   $k$   $d$   $c$

$a \rightarrow$  reflected in the x axis

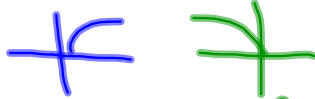
$y$



$\rightarrow$  vertically stretched by a factor of 2.



$k \rightarrow$  reflected in the y axis

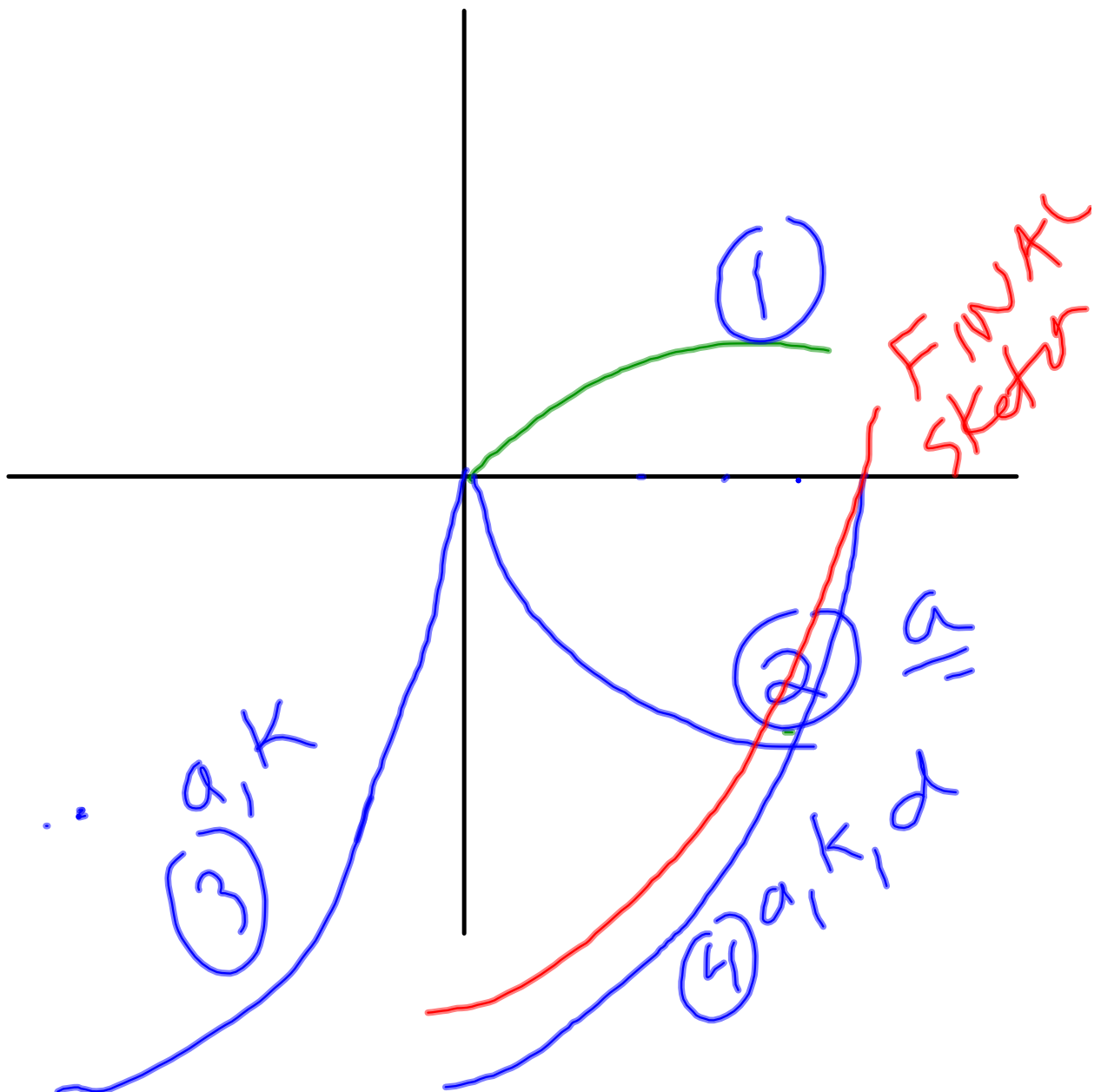


$\rightarrow$  horizontal compression

$d \rightarrow$  shift right 5 units

$c \rightarrow$  shift up 1 unit

$$f(x) = \sqrt{x}$$



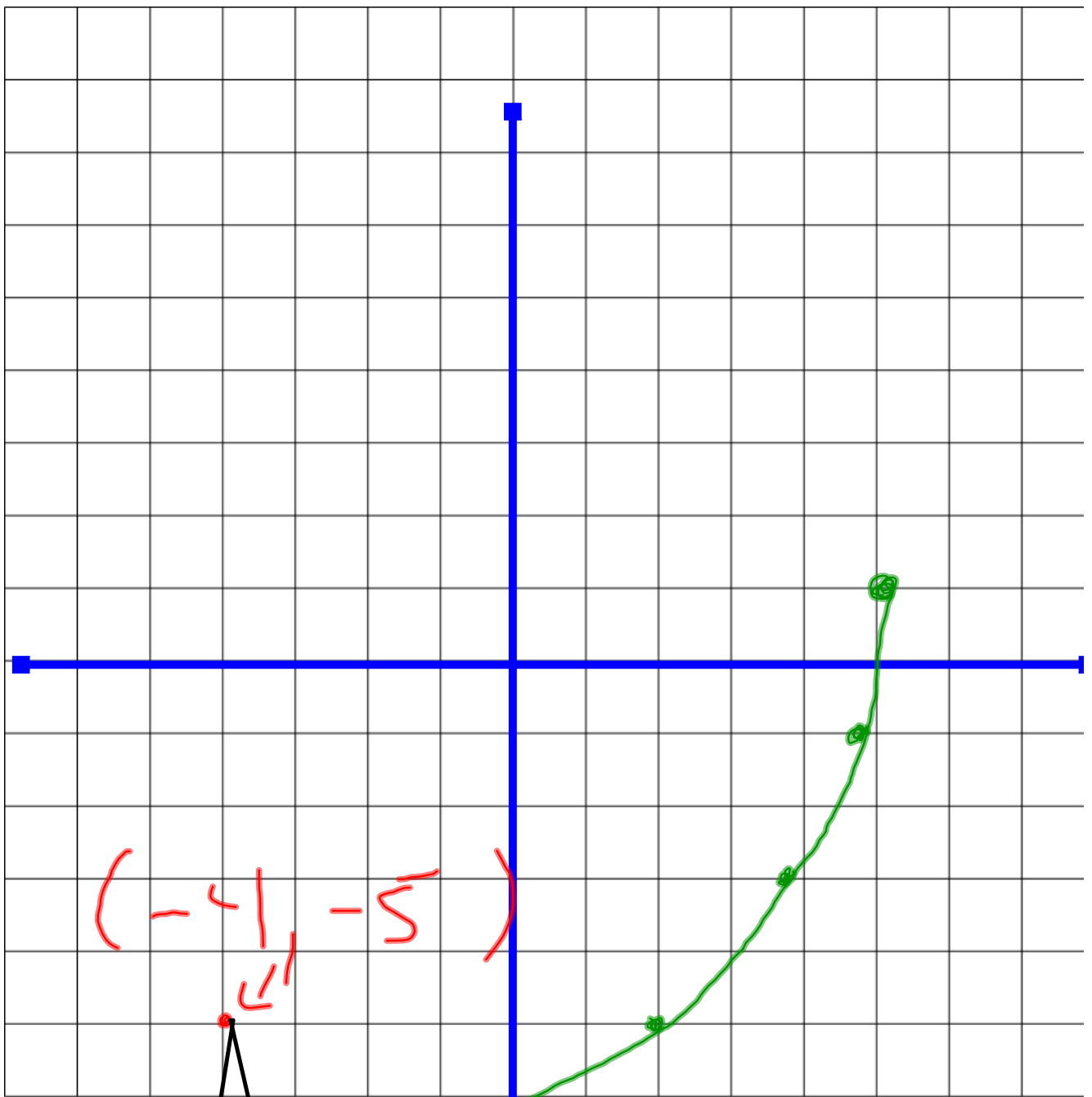
$$y = -2f[-2[x-5]] + 1$$

$a$ 
 $k$ 
 $d$ 
 $c$

<del>0</del>	<del>5</del>	<del>1</del>
<del>-3</del>	<del>5</del>	<del>1</del>
<del>-0.3</del>	<del>4.7</del>	<del>-1</del>
<del>-1.3</del>	<del>3.7</del>	<del>-3</del>
<del>-3</del>	<del>2</del>	<del>-5</del>

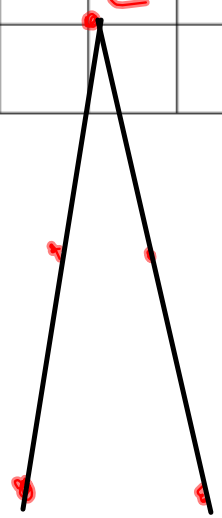
$x$	$y$
5	1
4.7	-1
3.7	-3
2	-5





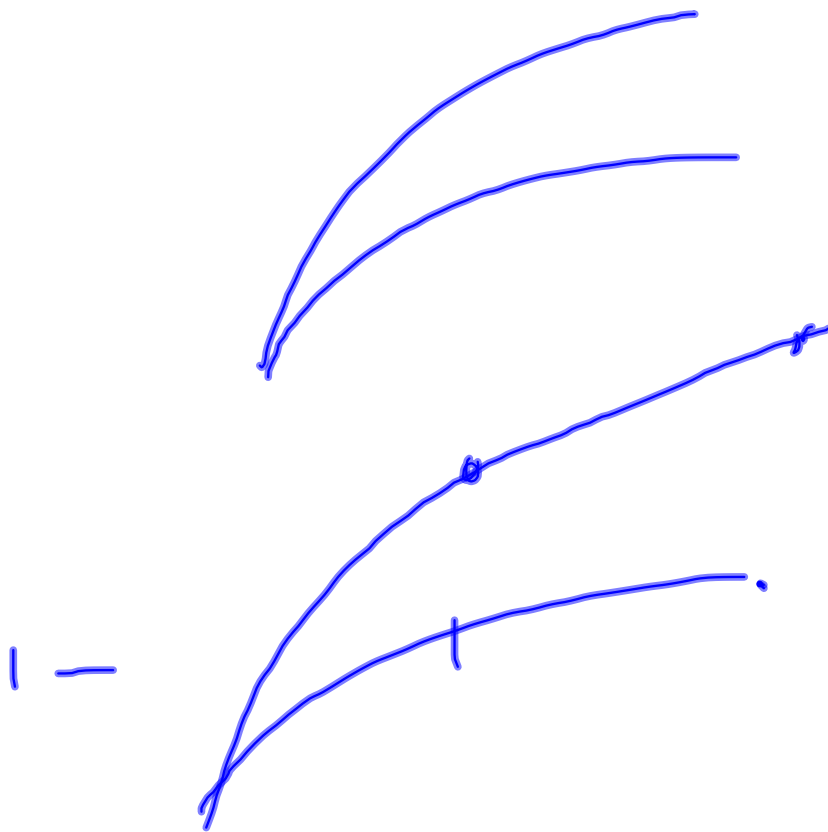
$(-4, -5)$

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	x	y
-4	-2	x - 3 = -5
-5	<del>-2</del> -1	<del>2</del> -6 = -11
-4.5	<del>-1</del> -0.5	<del>1</del> -3 = -8
-4	<del>0</del> 0	<del>0</del> 0 = -5
-3.5	<del>1</del> 0.5	<del>1</del> -3 = -8
-3	<del>2</del> 1	<del>2</del> -6 = -11

x	y
-5	-11
-4.5	-8
-4	-5
-3.5	-8
-3	-11



$$y = a f[k(x-d)] + c$$

k

- horizontal stretch/compression
- reflection in y-axis if negative
- divide "x" by k

- a "compression" if  $|k| > 1$
- a "stretch" if  $0 < |k| < 1$

Example 2: If (4,2) is on  $f(x) = \sqrt{x}$  then what is the point that is located on the transformed function  $y = f(.5x)$

$$y = a f[k(x-d)] + c$$

- a
- vertical stretch/compression
  - reflection in x-axis if "a" is negative
  - multiply "y" by a
- 
- a "stretch" if  $|a| > 1$
  - a "compression" if  $0 < |a| < 1$

Example 1: If (4,2) is on  $f(x) = \sqrt{x}$  then what is the point that is located on the transformed function  $y = 3f(x)$

$$y = a f[k(x-d)] + c$$

- d
- horizontal translation
  - left if positive  
    subtract d from x
  - right if negative  
    add d to x

Example 3: If (4,2) is on  $f(x) = \sqrt{x}$  then what is the point that is located on the transformed function  $y = f(x-4)$

$$y = a f[k(x-d)] + c$$

- c
- vertical translation
  - up if positive  
add c to y
  - down if negative  
subtract c from y

Example 4: If (4,2) is on  $f(x) = \sqrt{x}$  then what is the point that is located on the transformed function  $f(x) = \sqrt{x} - 10$

$$y = -5x^2$$

$$y = (x - 3)^2$$

$$y = (2x)^2$$

$$y = (x + 6)^2$$

$$y = x^2 - 2$$



**Example 5:** State the function that would result from vertically stretching  $y=f(x)$  by a factor of 4 and then translating the graph 3 units to the left.

**Example 6:** Use transformations to help you describe the characteristics of the transformed function  $y = -3|2(x + 4)| - 5$

Then sketch the transformed function.

**Example 6:** Use transformations to help you describe the characteristics of the transformed function  $y = \frac{0.5}{x-3} + 5$

Then sketch the transformed function.

**Example 7:**

Describe the order in which you would apply the transformations defined by  $y = -2f[3(x+1)] - 4$  to  $f(x) = |x|$ .

Then state the impact of the transformations on the domain and range of the transformed function.

State the equation of the transformed function.

**Example 8:** Describe the order in which you would apply the transformations defined by  $y = -2f[3(x+1)] - 4$  to  $f(x) = \sqrt{x}$ .

State the impact of the transformations on the domain and range of the transformed function.

State the equation of the transformed function.